

METHOD AND SYSTEM FOR DETECTING TRACE MATERIALS IN CRYOGENIC LIQUIDS

ABSTRACT

A method for qualitative and quantitative determination of trace impurities in a cryogenic liquid, comprising the steps of (i) measuring the absorption spectrum of the cryogenic liquid by passing light in the infrared region through the cryogenic liquid, the cryogenic liquid absorption spectrum having a first reference energy, (ii) measuring the absorption spectrum of at least one impurity alone by passing light in the infrared region through the impurity, (iii) passing a cryogenic liquid sample into a flow cell, wherein the maximum pressure drop of the cryogenic liquid sample across said flow cell is in the range of 0.5 to 5.0 lb./in.², (iv) measuring the absorption spectra of the cryogenic liquid sample by passing light in the infrared region through the cryogenic liquid sample while the cryogenic liquid sample is within the cell, (v) comparing the cryogenic liquid sample absorption spectra to the cryogenic liquid and impurity spectra, (vi) confirming the presence of the sample absorption spectrum associated with the impurity, the sample absorption spectrum associated with the impurity having a second reference energy, and (vii) determining the concentration (C) of the impurity in the cryogenic liquid sample by the following relationship,

$$kC = \log \frac{\text{second reference energy}}{\text{first reference energy}}$$

where k is a fixed proportionality constant.

